



100 → struct
102 → {
104 → Unsigned int a : 1;
106 → Unsigned int b : 2;
106 → Unsigned int c : 8;
106 → } abc

Fig.1 (Prior Art)

108 → abc.b = value
110 → readvalue = abc.b

Fig.2 (Prior Art)

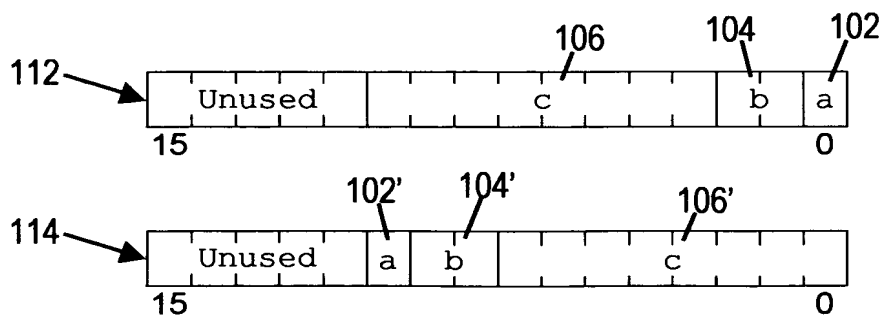


Fig.3 (Prior Art)



```

116 → unsigned int abc;
118 → #define MASK_a 0001 // 0000000000000001
120 → #define MASK_b 0006 // 0000000000000110
122 → #define MASK_c 07f8 // 0000011111111000
124 → #define SHIFT_a 0000
126 → #define SHIFT_b 0001
128 → #define SHIFT_c 0003
  
```

Fig.4 (Prior Art)

```

130 → abc = (abc AND ~MASK_b) OR (value << SHIFT_b)
132 → readvalue = (abc AND MASK_b) >> SHIFT_b
  
```

Fig.5 (Prior Art)

	abc		YYYYYYYYYYYYYYYY	←134
	~MASK_b		111111111111001	←136
	abc AND ~MASK_b		YYYYYYYYYYYYY00Y	←138
	value		000000000000011	←140
	value << SHIFT_b		0000000000000110	←142
(abc AND ~MASK_b) OR (value << SHIFT_b)			YYYYYYYYYYYYY11Y	←144

Fig.6 (Prior Art)



200 → #define <name of bit-field> <BFDN>u

Fig.7

202 204
 ↓ ↓
BFDN ← LEFT-BIT:RIGHT-BIT

Fig.8

212
↓
Struct
{
 Unsigned long field;
 #define a 0000u
 #define b 0201u
 #define c 1003u
} abc

206
|
208 210

Fig.9

214
↓
Struct
{
 Unsigned long field;
 #define a 1010u
 #define b 908u
 #define c 700u
} cba

216
|
218 220

Fig.10

222 → WRITE_BITFIELD(abc, b, value)

224 → readvalue = READ_BITFIELD(abc, b)

Fig.11



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```

226  #define LEFTBIT(BFDN) (BFDN / 100)
227  #define RIGHTBIT(BFDN) (BFDN % 100)
228
229  #define FIELDMASK(BFDN) \
230      (~(fffe << (LEFTBIT(BFDN) - RIGHTBIT(BFDN))) << RIGHTBIT(BFDN))
231
232  #define READ_BITFIELD(ADDRESS, BFDN) \
      ((ADDRESS AND FIELDMASK(BFDN)) >> RIGHTBIT(BFDN))
233
234  #define WRITE_BITFIELD(ADDRESS, BFDN, VALUE) \
      (ADDRESS = ((ADDRESS AND ~FIELDMASK(BFDN)) | \
      ((VALUE << RIGHTBIT(BFDN)) AND FIELDMASK(BFDN))))
  
```

Fig.12

```

236  ADDRESS | abc = YYYYYYYYYYYYYYYY
238  BFDN | b = 0201
240  VALUE | 3 = 00000000000000011
242  LEFTBIT(0201) | 02
244  RIGHTBIT(0201) | 01
246  FIELDMASK(0201) |
248  LEFTBIT - RIGHTBIT | 1
250  Fffe << 1 | 1111111111111100
252  ~(Fffe << 1) | 0000000000000011
254  (~(Fffe << 1)) << 01 | 0000000000000110
256  WRITE_BITFIELD(abc, b, 3):
258  ~FIELDMASK | 1111111111111001
260  abc AND ~FIELDMASK | YYYYYYYYYYYY00Y
262  VALUE << RIGHTBIT | 0000000000000110
264  {VALUE << RIGHTBIT} AND FIELDMASK | 0000000000000110
266  ADDRESS | YYYYYYYYYYYY11Y
  
```

Fig.13